Patent Claims

1.
Apparatus for carrying out liquid-liquid micro extraction or liquid-liquid-liquid micro extraction with high enrichment, c h a r a c t e r i s e d in that it comprises
a)   a container for a sample solution having volume Vs with dissolved substance, analyte, to be analysed,
b)   a second container arranged in the first container, preferably a disposable container, having permeable membrane walls, for an acceptor solution, having volume Va, wherein
        1)   Vs:Va ≥ 50 and
        2)   about 1μl ≤ Va ≤ 50 μl,
c)   stirring means, preferably a magnetic bar.

2.
Apparatus according to 1, c h a r a c t e r i s e d in that the container for the acceptor solution is a microporous hollow fibre.

3.
Apparatus according to claims 1 and 2, c h a r a c t e r i s e d in that the container is a hollow fibre of an active polymer.

4.
A method for liquid-liquid micro extraction with high enrichment by the use of the apparatus according to claim 1, c h a r a c t e r i s e d in that
a)   the container for acceptor solution is lowered into an acceptor solution so that the membrane wall is impregnated with and the container is filled with a defined volume of the acceptor solution,
b)   the container filled under a) is transferred to the container having a defined volume of the sample solution with the analyte that is sought,
c)   the sample solution with analyte is stirred until extraction equilibrium is established for the analyte in the two solutions, and
d)   the acceptor solution containing enriched analyte is removed from its container for analysis of the analyte.

5.

A method for liquid-liquid-liquid micro extraction with high enrichment by the use of the apparatus according to claim 1, characterised in that

a)   the walls of the container for the acceptor solution are impregnated with, for immobilisation of, a liquid that is immiscible with the sample solution and the acceptor solution,

b)   the container for acceptor solution is filled with a defined volume thereof and

c)   is lowered into the container having a defined volume of the sample solution with the analyte that is sought,

d)   the sample solution with analyte is stirred until extraction equilibrium is established between

   i)   the sample solution and the immobilised liquid, and

   ii)   the immobilised liquid and the acceptor solution, and

e)   the acceptor solution with enriched analyte is removed from its container for analysis of the analyte.

6.

A method according to claims 4 and 5, characterised in that a microporous hollow fibre is used as the container for acceptor liquids.

7.

A method according to claim 5, characterised in that a microporous hollow fibre made of an active polymer is used as the container for the acceptor liquid.

8.

A method according to claims 5 to 7, characterised in that both the sample solution and the acceptor solution are aqueous liquids.

9.

A method according to claims 5, 6 and 8, characterised in that the liquid immobilised in the membrane is an organic liquid immiscible with aqueous liquids.

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10.

A method according to claims 5 to 9, c h a r a c t e r i s e d i n that the sample solution is a basic, aqueous biological sample and the acceptor solution is an acidified, aqueous liquid for extraction of basic analytes.

11.

A disposable device for use in liquid-liquid micro extraction, c h a r a c t e r i s e d i n that it has the form of a sponge body having defined pore volume for absorption of an immobilised acceptor solution for an analyte from a volume of a sample solution.